

9-1-1993

## Exiting the Twilight Zone: Changes in the Standard for the Admissibility of Scientific Evidence in Georgia

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### Recommended Citation

Katharyne C. Johnson, *Exiting the Twilight Zone: Changes in the Standard for the Admissibility of Scientific Evidence in Georgia*, 10 GA. ST. U. L. REV. (1993).

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# EXITING THE TWILIGHT ZONE: CHANGES IN THE STANDARD FOR THE ADMISSIBILITY OF SCIENTIFIC EVIDENCE IN GEORGIA

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized . . . .<sup>1</sup>

## INTRODUCTION

The use of scientific evidence in civil and criminal trials has become commonplace. As new scientific developments have moved from the laboratory to the forensic setting, an explosive growth has occurred in the variety of courtroom situations where scientifically based evidence is used.<sup>2</sup> At the same time, the scientific theories that underlie the forensic tests, as well as the equipment and techniques used in testing scientific evidence, have become increasingly complex and technically sophisticated.

Evidence derived from scientific testing or based on scientific opinion has a profound effect upon a lay jury.<sup>3</sup> However, all science is not created equal. "Good" science may often be difficult to distinguish from "bad" or "junk" science,<sup>4</sup> which carries an

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1. *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923).

2. Paul C. Giannelli, *Criminal Discovery, Scientific Evidence, and DNA*, 44 VAND. L. REV. 791 (1991). The author notes the media attention to the use of scientific evidence in notorious criminal trials: bite mark evidence and hypnotically refreshed testimony in the Ted Bundy murder trial; fiber evidence in the Wayne Williams mass murder trial; pathology and serology testimony in the Jean Harris (Scarsdale Diet Doctor) murder trial; forensic evidence of wounds in the Jeffrey MacDonald (Green Beret Doctor) trial; and ballistics, shoeprints, and fingerprints in the Night Stalker serial murder trial. *Id.* at 792-93. In the civil context, toxic tort plaintiffs frequently rely upon scientific evidence such as epidemiological studies to show causation. *Id.* Notable examples include litigation surrounding Agent Orange, asbestos, silicone breast implants, and pharmaceutical products. *Id.*

3. James M. Doyle, *Applying Lawyers' Expertise to Scientific Experts: Some Thoughts about Trial Court Analysis of the Prejudicial Effects of Admitting and Excluding Expert Scientific Testimony*, 25 WM. & MARY L. REV. 619 (1984); see also Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States a Half-Century Later*, 80 COLUM. L. REV. 1197 (1980).

4. PETER W. HUBER, *GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM* (1991). "Junk science" is a term coined by the author to describe science based on "data dredging, wishful thinking, truculent dogmatism, and, now and again, outright fraud." *Id.* at 3.

aura of proven reliability, but which in fact may be defective either in theory or in practical application.<sup>5</sup>

Trial attorneys, judges, and juries, often with little or no scientific education, are called upon to determine the probative value of widely variant types of scientific evidence. Certain types of scientific evidence, such as fingerprints and ballistic tests,<sup>6</sup> are well known to laypersons and are easily understood. Further, these types of tests may be relied upon merely as a "brick" in the evidentiary wall. However, other types of scientific evidence, such as DNA "fingerprinting,"<sup>7</sup> are highly complex and so technical that they are beyond the understanding of some nonscientists. To further compound the problem facing the court, this highly technical and complex scientific evidence may alone be dispositive of the case.

Two horns of a dilemma confront the trial judge charged with ruling on the admissibility of scientific evidence. First, should the evidence be admitted, there is the risk that the jury may give value to evidence which is unjustified because the underlying scientific theory is not reliable, the testing method lacks validity,<sup>8</sup> or the test results were compiled in a way that

5. *Id.*

6. PAUL C. GIANNELLI & EDWARD J. IMWINKELRIED, *SCIENTIFIC EVIDENCE* (1986). Ballistics is the study of the motion of a projectile. *Id.* at 385-86. Even a science as established as ballistics may utilize a variety of testing techniques. *Id.* For example, a ballistics expert may identify a recovered bullet as one fired from a particular gun by examination of the projectile within the gun, after it leaves the gun, or by the effects of the bullet within the target. *Id.*

7. CHARLOTTE WOOD, *INSTITUTE OF CONTINUING LEGAL EDUCATION IN GEORGIA, DNA FINGERPRINTING AND DNA PROFILING* (1990). DNA fingerprinting is a technique in which deoxyribonucleic acid (DNA, the genetic material found within the chromosomes of each living cell) is extracted from a sample of blood, semen, or other cells which contain DNA. *Id.* at 3-6. The extracted DNA is cut apart using restriction enzymes and placed at one end of a sheet of gel. *Id.* The sheet is exposed to an electric field, which causes the different sized DNA fragments to move across the gel at differing rates, forming bands. *Id.* The fragments are transferred from the gel and permanently affixed to a nylon membrane. *Id.* Radioactively labeled probes are added to a solution in which the membrane has been immersed. *Id.* The probes attach themselves to the specific bands of DNA that they "fit." *Id.* The pattern of bands is unique for each individual, with the exception of identical twins. *Id.* A film that is sensitive to the radioactivity is then placed against the nylon membrane. *Id.* The probes expose the film and provide an image of the location of the DNA bands. *Id.* This image is called a DNA "fingerprint." *Id.*

8. See Giannelli, *supra* note 3, at 1201 n.20. As used scientifically, the terms "reliability" and "validity" are not synonymous. *Id.* Reliability refers to the consistency with which the same results may be obtained by the application of the same test. *Id.* Validity refers to the accuracy of a test procedure in measuring what it is used to

compromised their accuracy. Trial judges also are aware that lay jurors are at a disadvantage when attempting to critically evaluate scientific testimony.<sup>9</sup>

A separate type of risk is presented when evidence is excluded. Important, probative information may be kept from the jury, which must then make its determination upon incomplete facts, or upon facts which cannot be properly placed in context.<sup>10</sup>

Trial judges, who are generally nonscientists, recognize that even experts within a field may disagree about the correctness of a particular theory or testing technique.<sup>11</sup> The task before the court, however, is not one of academic debate. Notwithstanding a lack of consensus among scientific experts, the trial judge is faced with the need for an immediate ruling in a particular case, often with the recognition that the ruling may determine the outcome of the case.<sup>12</sup>

Courts have long searched for a workable means by which to balance the probative value of scientific evidence against the possibility that such evidence may be unreliable or invalid, or may be given undue weight by a scientifically unsophisticated jury. The traditional standard against which the reliability of scientific evidence is measured was set out in *Frye v. United States*.<sup>13</sup> Under the *Frye* standard, the proponent of scientific evidence must establish that the scientific principle relied upon is generally accepted by the appropriate scientific community.<sup>14</sup>

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measure, that is, does the principle support what it purports to show. *Id.* For example, "reliable" means that John may be found on the courthouse steps every morning at 9:00 a.m., as measured by the chiming of the courthouse clock. *Id.* "Valid" means the clock chimes nine times when it is precisely 9 o'clock. *Id.* An assessment of validity (e.g., accuracy) necessarily incorporates reliability (e.g., consistency); however, in scientific parlance a particular test may be remarkably reliable (consistent) yet utterly invalid. See also Bert Black, *A Unified Theory of Scientific Evidence*, 56 *FORDHAM L. REV.* 595 (1988) (noting that validity and reliability are but two complementary aspects of relevancy).

9. See generally Doyle, *supra* note 3.

10. Giannelli, *supra* note 3, at 1237; see also Andre A. Moenssens, *Admissibility of Scientific Evidence—An Alternative to the Frye Rule*, 25 *WM. & MARY L. REV.* 545 (1984); Cathleen C. Herasimchuk, *A Practical Guide to the Admissibility of Novel Expert Evidence in Criminal Trials under Federal Rule 702*, 22 *ST. MARY'S L.J.* 181 (1990).

11. See generally Herasimchuk, *supra* note 10.

12. See Giannelli, *supra* note 2, at 794. Professor Giannelli reports that 25% of jurors rendering guilty verdicts in trials involving scientific evidence would have rendered a not guilty verdict in the absence of the scientific evidence. *Id.*

13. 293 F. 1013 (D.C. Cir. 1923).

14. *Id.* at 1014.

The *Frye* standard has been praised as effectively restricting experimental science to the laboratory, rather than allowing the courtroom to become a testing ground for novel scientific theories.<sup>15</sup> At the same time, the *Frye* test has been widely criticized. Commentators and courts have complained that the *Frye* test is applied inconsistently and followed sporadically,<sup>16</sup> is too conservative,<sup>17</sup> and keeps important probative evidence from the jury.<sup>18</sup> Despite this divergence of views, for seventy years the *Frye* standard of general acceptance remained the applicable standard in a number of state and federal jurisdictions.

The *Frye* standard of general acceptance in the scientific community was the prevailing standard at the time the Federal Rules of Evidence were drafted.<sup>19</sup> With the adoption of the Federal Rules of Evidence, the continued viability of the *Frye* test became a matter of great debate.<sup>20</sup> However, neither the

15. In *United States v. Brown*, the court stated:

A courtroom is not a research laboratory. The fate of a defendant in a criminal prosecution should not hang on his ability to successfully rebut scientific evidence which bears an 'aura of special reliability and trustworthiness,' although, in reality the witness is testifying on the basis of an unproved hypothesis in an isolated experiment which has yet to gain acceptance in its field.

*United States v. Brown*, 557 F.2d 541, 556 (6th Cir. 1977).

16. Certain scientific techniques have enjoyed scientific acceptance, only later to be criticized. See GIANNELLI, *supra* note 6, at 315-17 (discussing that voice spectrographic evidence was initially reviewed favorably, but later determined to be subject to serious error and unreliable by a study of the Federal Bureau of Investigations (FBI)). More commonly, a scientific technique accepted in the laboratory setting may be taken to the forensic setting, where its applicability is later questioned. For example, the underlying theory of DNA fingerprinting enjoys widespread acceptance both in the laboratory and forensic settings; however, the methodology used in testing, as well as the significance of purported matches, is frequently disputed. *Id.* Additionally, a widely disregarded form of scientific evidence may, over time, actually gain some degree of scientific acceptance. See *United States v. Piccinonna*, 885 F.2d 1529 (11th Cir. 1989) (declining to follow a long-standing precedent which held that polygraph evidence was per se inadmissible, noting advances in equipment and training of test administrators, as well as extensive use of polygraph testing in the non-forensic setting).

17. See Giannelli, *supra* note 3, at 1224; Black, *supra* note 8; Moenssens, *supra* note 10.

18. See Giannelli, *supra* note 3, at 1224.

19. 2 GREGORY P. JOSEPH & STEPHEN A. SALTZBURG, EVIDENCE IN AMERICA: THE FEDERAL RULES IN THE STATES § 51 (1988).

20. *Daubert v. Merrell Dow Pharmaceuticals*, 113 S. Ct. 2786, 2793 n.4 (1993) (noting that the debates over *Frye* were "such a well-established part of the academic landscape that a distinct term—'*Frye*-ologist'—has been advanced to describe those who take part").

language nor the advisory committee notes of Rule 702, which addresses scientific evidence, make reference to the *Frye* test.<sup>21</sup> Federal Rule 702<sup>22</sup> establishes a relevance standard, where the admissibility of scientific evidence is conditioned upon the helpfulness of the evidence to the finder of fact. The relevance, and hence the admissibility, of proffered scientific evidence turns upon a balance of its helpfulness to the finder of fact against the possibility that the evidence will be misunderstood, misapplied, or otherwise lead to confusion.<sup>23</sup>

The relevance standard of Rule 702 incorporates the permissive stance taken by the Federal Rules in admitting all evidence that has probative value.<sup>24</sup> The helpfulness test is broader than a requirement that scientific testimony be permitted only where necessary because the evidence falls outside the ordinary comprehension of the jury.<sup>25</sup>

Prior to the decision of the U.S. Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals*,<sup>26</sup> the federal circuits were in disagreement whether the adoption of the Federal Rules of Evidence incorporated the *Frye* test or simply discarded it,<sup>27</sup> or whether the Rules neither repudiated nor incorporated *Frye*, but instead mandated an analysis of the methodology employed.<sup>28</sup> State courts showed a similar lack of consistency in articulating the standard to be applied in their courts.<sup>29</sup>

21. JOSEPH & SALTZBURG, *supra* note 19, at 16.

22. Federal Rule of Evidence 702 provides: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise." Fed. R. Evid. 702.

23. JOSEPH & SALTZBURG, *supra* note 19, at 16-17; *see also* Herasimchuk, *supra* note 10, at 206-07.

24. JOSEPH & SALTZBURG, *supra* note 19, at 15.

25. *Id.*

26. 113 S. Ct. 2786 (1993).

27. *See* United States v. Williams, 583 F.2d 1194 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979) (noting that Federal Rules of Evidence supersede *Frye* test); *cf.* Christopherson v. Allied-Signal Corp., 939 F.2d 1106 (5th Cir. 1991), *cert. denied*, 112 S. Ct. 1280 (1992) (noting *Frye* test is incorporated into Federal Rules of Evidence).

28. United States v. Downing, 753 F.2d 1224 (3d Cir. 1985).

29. JOSEPH & SALTZBURG, *supra* note 19, at 2. The Federal Rules of Evidence are not binding upon the state courts; however, twenty-seven states have adopted Rule 702 verbatim. *Id.* Ten states continue to explicitly follow *Frye*. *Id.* at 2 n.16. Other states, such as Georgia, have defined their own standard. *Id.*

In *Daubert v. Merrell Dow Pharmaceuticals*,<sup>30</sup> the U.S. Supreme Court laid the long-standing dispute to rest, at least in the federal courts. The plaintiffs in *Daubert* were two boys born with serious birth defects and their parents.<sup>31</sup> The plaintiffs alleged that the drug Bendectin, an anti-nausea drug taken by the mothers during early pregnancy, was the cause of the birth defects.<sup>32</sup> Defendant Merrell Dow, which marketed the drug, moved for summary judgment supported by the affidavit of an expert physician-epidemiologist.<sup>33</sup> The expert concluded, on the basis of a review of more than thirty published studies, that Bendectin had not been shown to be a risk factor for human birth defects.<sup>34</sup>

The plaintiffs responded to the defendant's motion with the testimony of eight other experts, each of whom concluded that Bendectin can cause birth defects.<sup>35</sup> The plaintiffs' experts based their conclusions on animal studies, pharmacological studies of the chemical structure of Bendectin, and re-analysis of previously published epidemiological studies.<sup>36</sup>

The trial court granted the defendant's motion for summary judgment, ruling that scientific evidence is admissible only if the principle upon which it is based is "sufficiently established to have general acceptance in the field to which it belongs."<sup>37</sup> The district court ruled that the plaintiffs' evidence failed to meet this standard.<sup>38</sup> The court of appeals affirmed, citing *Frye* and ruling that expert opinion based on methodology that diverges "significantly from the procedures accepted by recognized authorities in the field . . . cannot be shown to be generally accepted as a reliable technique."<sup>39</sup>

The Supreme Court reversed, holding that the *Frye* test had been supplanted in the federal courts by Federal Rule of Evidence 702.<sup>40</sup> Under the *Daubert* standard, the trial court's

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30. 113 S. Ct. 2786 (1993).

31. *Id.* at 2791.

32. *Id.* at 2791.

33. *Id.*

34. *Id.*

35. *Id.*

36. *Id.* at 2791-92.

37. *Daubert v. Merrell Dow Pharmaceuticals*, 727 F. Supp. 570, 572 (S.D. Cal. 1989).

38. *Daubert*, 113 S. Ct. at 2792.

39. *Daubert v. Merrell Dow Pharmaceuticals*, 951 F.2d 1128, 1130 (9th Cir. 1991).

40. 113 S. Ct. at 2794.

focus is not whether the proffered scientific evidence enjoys general acceptance in the scientific community, but instead whether the evidence has been derived from sound scientific procedure.<sup>41</sup> Where the court finds that sound procedure has been employed, the resultant data or conclusions may be admitted, without regard for novelty or controversy. Rather, evidentiary reliability will be based on scientific validity.<sup>42</sup>

The Supreme Court's analysis in *Daubert* was founded on an interpretation of the language and legislative history of the Federal Rules of Evidence.<sup>43</sup> Thus, *Daubert* is mandatory authority only in the federal courts. While not binding, however, the decision will be highly persuasive authority in those states which by statute have adopted Rule 702.<sup>44</sup>

Georgia is not among those states which have expressly adopted Federal Rule of Evidence 702. However, Georgia courts, at least in form if not in substance, rejected the *Frye* test long before the Supreme Court's ruling in *Daubert*.<sup>45</sup> While the *Daubert* decision is not controlling in Georgia courts, the Supreme Court's analysis in that case provides highly instructive guidance for trial courts faced with a proffer of scientific evidence, under any standard.

This Note describes the development of the Georgia rule regarding the admissibility of scientific evidence. Examined are the means by which courts have analyzed the scientific reliability of the proffered evidence, and how the courts have sought to strike a balance between the risk of excluding important probative evidence, and the possibility that the fact-finder may attach undue value to poor science or to poorly understood

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41. *Id.*

It would be unreasonable to conclude that the subject of scientific testimony must be "known" to a certainty; arguably there are no certainties in science . . . . In order to qualify as "scientific knowledge" an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation—good grounds—based on what is known. In short, the requirement that an expert's testimony pertain to "scientific knowledge" establishes a standard of evidentiary reliability.

*Id.* at 2795.

42. *Id.* at 2795 n.9.

43. *Id.* at 2793-94.

44. Edward J. Imwinkelried, *The Daubert Decision: Frye is Dead, Long Live the Federal Rules of Evidence*, TRIAL, Sept. 1993, at 64.

45. See *Harper v. State*, 292 S.E.2d 389, 395-96 (Ga. 1982); see also *infra* notes 54-67 and accompanying text.



science. Also examined are several procedural means available through existing judicial and statutory provisions that may aid courts ruling on the admissibility of scientific evidence.

### I. ORIGINS OF THE GEORGIA RULE

Georgia cases which address the admissibility of scientific evidence mirror the lack of agreement found among the different federal and state jurisdictions. Georgia courts faced with scientific evidence have taken two significantly different approaches which incorporate elements of both the *Frye* standard of general acceptance and the Federal Rules approach of relevancy.

#### A. *Liberal Admission of All Scientific Evidence: Jenkins v. State*

In *Jenkins v. State*,<sup>46</sup> the Georgia Court of Appeals held that the results of tests using electrophoresis<sup>47</sup> performed on blood found at the scene of a rape were properly admitted into evidence.<sup>48</sup> The state proffered the test results in order to link the defendant to the crime.<sup>49</sup> The defendant objected to the admission of the test results on the grounds that the state had not shown the reliability of the electrophoresis procedure, nor had the procedure been shown to be generally accepted by the scientific community.<sup>50</sup>

In upholding the admissibility of the test evidence, the court of appeals found that the novelty of the electrophoresis testing procedure did not preclude the admission of either the test results or the expert's conclusions of their meaning.<sup>51</sup> The court held that the opinion of an expert on any question of science is

46. 274 S.E.2d 618 (Ga. Ct. App. 1980).

47. See Randolph N. Jonakait, *Will Blood Tell? Genetic Markers in Criminal Cases*, 31 EMORY L.J. 833 (1982). Electrophoresis is a testing technique based on the underlying theory that blood proteins vary in size, shape, density, and electrical charge. *Id.* The electrophoresis test technique consists of placing blood on a gel medium and subjecting it to an electrical field. *Id.* The different proteins contained within the blood vary in electrophoretic mobility and hence differ in the degree to which each will migrate across the supporting medium. *Id.* Distinct patterns of protein, called bands, will form on the medium. *Id.* These bands are, to an arguable degree, unique to each individual. *Id.* at 840.

48. *Jenkins*, 274 S.E.2d at 619.

49. *Id.*

50. *Id.*

51. *Id.*

always admissible.<sup>52</sup> The record indicated that at trial the expert had explained the electrophoresis procedure and revealed the facts upon which he relied in drawing his conclusions.<sup>53</sup> Therefore, in the court's analysis, it was these underlying facts and not merely the expert's conclusions, that were before the jury.<sup>54</sup> The court framed the issue not as the standard for admissibility of scientific evidence, but rather as the weight to be given to a scientific expert's testimony.<sup>55</sup>

The *Jenkins* court limited its inquiry to noting that the expert had explained the procedure used, thus bootstrapping the admissibility of the testing procedure to the admissibility of the expert's opinion. Despite the defendant's objection to the state's failure to show the reliability of the underlying scientific theory, the court applied no standard to evaluate its soundness. Nor did the court inquire as to whether the new procedure had been correctly performed.

*Jenkins* establishes a high water mark for the admissibility of scientific evidence in Georgia. However, the *Jenkins* standard is flawed in its failure to provide safeguards against the overvaluation of possibly unreliable scientific evidence. The broad standard of *Jenkins* does not allow for judicial screening of evidence against a threshold standard of reliability. Instead, total reliance is placed on the jury's ability to sort and weigh the value of expert scientific evidence.

Whether the judge is more or less capable than the jury to make the distinction between an expert's explanations of scientific theory and technique and the opinions he has formed on the basis of testing is not readily determined.<sup>56</sup> Regardless, it is difficult to understand how any trier of fact could determine that the expert's conclusions were reliable without considering the underlying factors that might contribute to the validity, that is, accuracy, of the expert's opinions. The *Jenkins* court, in characterizing the evidence as factual, rather than as the

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52. *Id.*

53. *Id.*

54. *Id.*

55. *Id.* Even more perfunctorily, the court rejected *Jenkins*' contention that testimony regarding palm print analysis should not be allowed because the state failed to establish that palm prints were a reliable means of identification. *Id.* at 620.

56. See generally Doyle, *supra* note 3; see also John W. Wesley, Note, *Scientific Evidence and the Question of Judicial Capacity*, 25 WM. & MARY L. REV. 675 (1984). But see Black, *supra* note 8, at 681.

conclusions of an expert based on scientific data, failed to recognize the importance of the screening role of the trial court. The jury members were given unguided discretion to weigh the probative value of the test results based on their evaluation as laypersons of the underlying theoretical reliability of the test and proper application of the procedure. These shortcomings of the *Jenkins* standard are most apparent when a jury must make its determination on the basis of complex technical evidence, or when it has no opportunity to hear and evaluate contradictory evidence.<sup>57</sup>

*B. Some Showing of Reliability Necessary: Harper v. State*

*Jenkins* represents one fork of the analytical path traveled by Georgia courts. Two years after *Jenkins*, the Georgia Supreme Court decided *Harper v. State*.<sup>58</sup> In *Harper*, the trial court refused to admit the testimony of a psychologist as a defense expert in a murder trial.<sup>59</sup> The psychologist would have testified that while under the influence of sodium amytal, or "truth-serum," the defendant denied killing the victim.<sup>60</sup> The psychologist would also have testified that the use of sodium amytal enjoyed acceptance in the scientific community as a valid medical and psychiatric technique.<sup>61</sup>

The supreme court upheld the exclusion of the psychologist's testimony.<sup>62</sup> While Georgia courts had in the past applied the *Frye* test of general acceptance in the scientific community,<sup>63</sup> the *Harper* court found that approach unacceptable.<sup>64</sup>

57. See Wesley, *supra* note 56, at 679. The jury selection process tends to eliminate for cause individuals with special knowledge of a contested issue. *Id.* In cases where scientific evidence plays a large role, jurors with scientific background are likely to be excused from the panel. *Id.* The remaining jurors are unlikely to have the skills needed to critically evaluate scientific evidence when background information or expert testimony regarding reliability is unavailable, or where cross examination is insufficient to make possible shortcomings of the scientific technique apparent. *Id.* at 682.

58. 292 S.E.2d 389 (Ga. 1982).

59. *Id.* at 394.

60. *Id.*

61. *Id.*

62. *Id.* at 396.

63. See *Salisbury v. State*, 146 S.E.2d 776 (Ga. 1966).

64. *Harper*, 292 S.E.2d at 395. "After much consideration, we conclude that the *Frye* rule of counting heads in the scientific community is not an appropriate way to determine the admissibility of a scientific procedure in evidence." *Id.*

The supreme court addressed the problems encountered by trial courts in applying the *Frye* test: the bias of retained experts in favor of the retaining party and the resultant "battle of the experts," the existence of variations of opinion within a particular discipline, and the recognition that even a qualified expert may be limited in his understanding of the particular discipline.<sup>65</sup> In place of the *Frye* standard of general acceptance, the court set out a new test: "[I]t is proper for the trial judge to decide whether the procedure or technique in question has reached a scientific stage of verifiable certainty or . . . whether the procedure rests upon the laws of nature."<sup>66</sup>

The *Harper* Court addressed *Jenkins* in a footnote.<sup>67</sup> While the supreme court did not take a literal view of the language expressed by the court of appeals, that "the opinion of an expert on any question of science is always admissible,"<sup>68</sup> *Harper* did not overrule *Jenkins*.<sup>69</sup> However, the holding of the supreme court implied that the standard for admission of scientific evidence in Georgia would now require an affirmative finding by the court of the verifiable certainty of the proffered evidence.<sup>70</sup>

Despite its express rejection of the *Frye* standard of general acceptance, the *Harper* verifiable certainty standard, as a practical matter, bears remarkable similarity. The *Harper* standard, like that of *Frye*, limits the inquiry to a determination of the established reliability of the theory underlying a particular piece of scientific evidence. Tremendous discretion is given to the trial judge to determine the verifiable certainty of the technique in question or whether a procedure rests upon the laws of nature.<sup>71</sup> In determining whether proffered evidence has

65. *Id.*

66. *Id.*

67. *Id.* at 395 n.10.

68. *Id.* (quoting *Jenkins*, 274 S.E.2d 618, 619 (Ga. Ct. App. 1980)).

69. *Harper*, 292 S.E.2d at 395.

70. *Id.* The *Harper* court was unable to determine from the *Jenkins* opinion whether the reliability of the electrophoresis procedure had been shown at trial; however, the court went on to say "[w]e do not read [*Jenkins*] . . . to mean that an expert may give an opinion based on the results of a procedure that has not been proven reliable." *Id.*

71. See WILLIAM H. AGNOR, AGNOR'S GEORGIA EVIDENCE 248 (2d ed. 1986). Exactly what comprises the "laws of nature" seems open to great speculation. *Id.* Professor Agnor describes this prong of the *Harper* test as "whatever that means." *Id.* Judge Deen, specially concurring in *Thornton v. State*, cautions trial courts to distinguish between those occurrences that are contrary to physical or natural laws, such as water running uphill, and occurrences that are incredible, unlikely or unbelievable as

achieved this standard, the trial court may be guided by (1) expert testimony presented at trial by the parties, (2) exhibits, (3) treatises, and (4) decisions of other jurisdictions.<sup>72</sup>

However, the guidelines offered in *Harper* are subject to the same pitfalls which motivated the Georgia Supreme Court to reject *Frye*. First, the testimony of hired experts regarding "verifiable certainty" is subject to the same sort of bias encountered when experts attempt to establish "general acceptance in the scientific community."<sup>73</sup> The meaning of the vague term "certain" becomes an issue.<sup>74</sup> An expert for the proponent of the evidence may testify that the verifiable certainty, meaning reliability, of a particular test is shown by wide acceptance of the underlying theory. An opponent of the evidence may testify that the verifiable certainty cannot be shown because experts in the field disagree, or that despite the soundness of the underlying theory, the testing procedure utilized does not incorporate that theory, and hence the test results are not certain because they are invalid.<sup>75</sup>

Second, the lack of consensus within a discipline and the common limits of an expert's knowledge that the *Harper* court found restricted the usefulness of the *Frye* test may be manifested in a published treatise as well as in trial testimony.<sup>76</sup> Trial judges and their clerks, untrained in scientific research, may fail to discover relevant publications in scientific,

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being contrary to expected human behavior. *Thornton v. State*, 287 S.E.2d 749, 751-52 (Ga. Ct. App. 1982) (Deen, J., concurring specially).

72. 292 S.E.2d at 395.

73. *Id.*

74. See generally Black, *supra* note 8, at 599. Loose extrapolation of scientific terms such as "certain," "reliable," and "valid" for courtroom purposes is frequently problematic. *Id.* Here, the court may not recognize the fine distinctions among the terms in scientific usage. *Id.* However, legal application of scientific terminology is possible. *Id.* Two examples where courts have successfully transferred scientific terms to a legal context are patent cases where the court must make a detailed appraisal of inventions and in the so-called "creation science" cases where the courts were called upon to distinguish scientific theory from religious doctrine. *Id.* at 682-85.

75. See *id.* At this juncture, courts that apply the *Frye* test and those that apply a relevance or other type analysis may reach different conclusions regarding the admissibility of the same type of evidence. *Id.* Black argues that courts rejecting *Frye* have in effect distinguished acceptance from reliability, but Black finds this approach to be only partially adequate. *Id.* "As a practical matter, fixing on the proper focus for legal analysis depends on understanding how theory, observation, and confirmation form an interwoven scientific fabric." *Id.* at 658.

76. Giannelli, *supra* note 3, at 1216.

rather than legal, journals.<sup>77</sup> New discoveries which call into question old theories may not be published in journals with wide circulation.<sup>78</sup> Worse, the trial judge with little or no scientific background may be at a decided disadvantage in evaluating conflicting theories held within a scientific community, without himself having the benefit of expert guidance.<sup>79</sup>

Finally, *Harper* disapproves “counting heads in the scientific community.”<sup>80</sup> Instead, the court may find that a particular technique or procedure satisfies the test of verifiable certainty by taking judicial notice that the technique or procedure has achieved acceptance in other jurisdictions.<sup>81</sup> Such reliance upon the rulings of other courts, without further inquiry into the specific application of a theory or technique to a particular case, merely replaces “scientific” heads with jurisdictional ones.<sup>82</sup>

The *Harper* standard, like that of *Frye*, creates a likelihood that the trial court will exclude important probative evidence because its verifiable certainty cannot be conclusively established. The analysis employed in *Harper* is subject to the risk that possibly reliable scientific evidence may be discarded simply because it is new, or because the court finds inadequate support in the scientific or legal literature.<sup>83</sup> The most troubling aspect of the *Harper* test, however, is that aspect of reliability into which the court need not inquire. Although it seemingly requires a rather stringent showing of the trustworthiness of the

77. *Id.*

78. *Id.*

79. Commentators have suggested that independent panels of experts provide research and guidance to trial courts on questions of novel scientific evidence. See Giannelli, *supra* note 3, at 1231-32; see also THOMAS F. GREEN, *GEORGIA LAW OF EVIDENCE* § 111 (3d ed. 1988) (“Common law, statutes, and rules have recognized the authority of a trial judge in civil and criminal cases to summon expert witnesses of his own choosing.”).

80. *Harper v. State*, 292 S.E.2d 389, 395 (Ga. 1982).

81. *Id.*

82. See Giannelli, *supra* note 3, at 1218. Reliance on decisions of other jurisdictions, without inquiry into the standard for the admission of scientific evidence applied by those courts, further distorts the consistency in decision sought after through the application of a special standard for scientific evidence. *Id.*

83. See Howard J. Goldmer, *Analytical Instrumentation*, RES. & DEV., Sept. 28, 1992, at 56. Rapid advances in scientific technology developed for commercial purposes further compound the court's inquiry when the technology is used for forensic purposes. *Id.* Analytical instruments and techniques previously judicially accepted may be altered by manufacturers, rapidly and quietly, in order to remain competitive within an industry and to avoid patent infringement problems. *Id.* The reliability of the new techniques may not replicate that of its predecessor. *Id.*

scientific premise which underlies proffered evidence, the *Harper* standard requires no inquiry into the validity of the methodology used in the analysis of forensic specimens or in the compilation of data. The *Harper* standard establishes no criteria by which to evaluate the reliability of a particular technique as applied, but instead establishes a rule of per se admissibility or inadmissibility, depending on a determination of the probability of general trustworthiness.<sup>84</sup>

The *Harper* test likely is sufficient in factual situations similar to *Harper*, where the particular scientific evidence at issue (truth serum) has widely been found *not* to be reliable. In that type of case, the inverse of the rule of verifiable certainty, or "verifiable uncertainty," may be applied with a high degree of confidence.<sup>85</sup> However, the standard set out in *Harper* provides little guidance when a trial court attempts to determine the admissibility of a novel or controversial type of scientific evidence.<sup>86</sup>

## II. REFINEMENT OF THE GEORGIA RULE

Georgia courts have struggled to find a fair and consistent means by which to apply the dual tests set out in *Jenkins* and *Harper*, particularly when novel scientific evidence is introduced. Under either standard, analytical gaps remain. To further compound the trial court's task, in addition to the difficulty in determining *which* standard should control and *how* to apply it, appellate courts have been inconsistent in determining *when* a particular piece of evidence warrants evaluation using a special standard for scientific evidence.

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84. See Giannelli, *supra* note 3, at 1212 (stating that proper analysis depends on focusing upon the distinction between the validity of a technique and the validity of its underlying theory).

85. See generally Giannelli, *supra* note 3, at 1202. When the reliability or unreliability of a particular type of evidence has been found to be sufficiently established, further inquiry into the underlying principle and validity of the technique employed in testing is not critical. *Id.* But see Giannelli, *supra* note 2, at 795. Even well established techniques are subject to procedural error. Few crime labs are regulated or participate in external quality assurance programs. An inquiry limited to the underlying reliability of a technique would be insufficient to detect testing errors of this sort. See *infra* note 150 and accompanying text.

86. The *Harper* decision provides little guidance to lower courts that attempt to apply its standard. *Harper*, 292 S.E.2d at 396. In reaching its decision, the *Harper* court applied only its third guideline. *Id.* Finding that a majority of jurisdictions had declined to admit the results of truth serum tests, the supreme court found the type of test to be per se inadmissible on the basis of findings of other courts. *Id.*

Some courts have simply found that a particular piece of evidence, while scientific in nature, does not represent a novel type of technology requiring the application of a specialized standard for admissibility. In *Pippin v. Burnum*,<sup>87</sup> the trial court admitted evidence derived from an "acre estimator."<sup>88</sup> The acre estimator was a device mounted on a combine which estimated the area of field which had been cut by calculating the number of times the combine's wheels turned, multiplied by the width of the cutter bar.<sup>89</sup> In response to the defendant's objection that the verifiable certainty of the acre estimator had not been shown, the court of appeals affirmed the admission of the results. The court reasoned that the acre estimator was not new technology which warranted a special showing of reliability, but rather that it was "a new application of two familiar and proven devices (an odometer and a calculator)."<sup>90</sup>

Other courts have failed to make a distinction between an established technique and a novel application of the same technique. In *Graham v. State*,<sup>91</sup> the court of appeals relied on the broad standard set out in *Jenkins* and incorporated into Georgia statutory law<sup>92</sup> the admission of a novel use of the electrophoresis test previously held in *Jenkins* to be admissible. In *Graham*, the state sought to admit the results of electrophoresis tests performed on samples of dried blood.<sup>93</sup> (In *Jenkins* the tests were performed on fresh blood.) The state also sought to admit the testimony of an expert witness regarding his opinion of the statistical implications of the electrophoresis test results.<sup>94</sup> The majority opinion did not specifically address the facts that the electrophoresis test, when performed on dried blood, was a novel application of the technique previously approved or that a difference in test methodology might be required to test dried blood samples. Citing *Jenkins*, the court

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87. 323 S.E.2d 857 (Ga. Ct. App. 1984).

88. *Id.* at 858.

89. *Id.*

90. *Id.* at 859.

91. 308 S.E.2d 413 (Ga. Ct. App. 1983).

92. O.C.G.A. § 24-9-67 provides: "The opinions of experts on any question of science, skill, trade, or like questions shall always be admissible; and such opinions may be given on the facts as proved by other witnesses." O.C.G.A. § 24-9-67 (1982).

93. *Graham*, 308 S.E.2d at 414 (Deen, J., concurring specially).

94. The statistical analysis relied upon by the expert witness was based on his own observations, which he testified coincided with the findings of other crime labs. *Id.* at 413.



found that the testimony was within the expert's area of expertise.<sup>95</sup> The defendant's objection to the state's failure to establish the reliability of the scientific procedure and to the statistical conclusions drawn from it would go to the weight of the evidence, rather than to its admissibility.<sup>96</sup>

In a special concurrence, Judge Deen recognized the importance of scrutinizing the methodology used by an expert when the trial court makes a determination of admissibility.<sup>97</sup> In Judge Deen's view, the reliability of a given technique must be examined with an eye toward the particular use of the evidence in the matter at hand and not admitted on the basis of the general reliability of the underlying theory or by virtue of its success in other types of applications.<sup>98</sup>

Judge Deen noted that, although Georgia had discarded the *Frye* test, the novel use of the electrophoresis test when used to examine dried blood likely did not satisfy the general acceptance standard.<sup>99</sup> However, the record indicated that the trial court made an in-depth inquiry into the general reliability of the electrophoresis procedure, and further, that other evidence supported the jury's finding.<sup>100</sup> Noting the great discretion afforded to the trial judge under the *Harper* standard, Judge Deen joined the majority, despite his misgivings about the admissibility of the electrophoresis evidence.<sup>101</sup>

*Graham* illustrates the risks created when a court attempts to apply a broad and unguided standard to determine the admissibility of different types of scientific evidence. *Graham* extended judicial acceptance to a modification of an old technique, without recognition that it might not be possible to

95. *Id.* at 414.

96. *Id.* at 413-14.

97. *Id.* at 414.

98. *Id.* Judge Deen viewed the question before the court as an inquiry into the new methodology and framed the issue as: "May new techniques of testing *dried* blood, which have not been implemented in field tests, receive the same credibility as those already associated with the testing of *fresh* blood?" *Id.* at 414 (Deen, J., concurring specially).

99. *Id.* "This test from *Frye*, although somewhat vague, appears at first blush to have been met in the present case, but closer scrutiny is not altogether satisfying." *Id.* In Judge Deen's view, the burden had fallen instead on the defendant to disprove the reliability of the state's evidence, rather than upon the proponent to initially show reliability. *Id.* at 415.

100. *Id.* at 416.

101. *Id.* at 416-17.

simply assume the newer "dried blood" technique was reliable, based on judicial rulings concerning the older "fresh blood" technique.<sup>102</sup>

The court's failure to determine the reliability of the new electrophoresis test was further compounded by its failure to inquire into the methodology employed by the statistician used in concluding that the blood samples linked the defendant to the crime. Two types of scientific evidence were introduced in *Graham*: (1) the electrophoresis procedure itself and (2) the statistical technique employed to give meaning to the test results. The court failed to recognize that even properly calculated data is without value when it is derived from an invalid test, and that even a reliable test may lead to erroneous conclusions when data is improperly construed.

Statistical evidence rests on two theoretical bases: first, that of the underlying test procedure through which the data is accumulated, and second, that of the theory underlying the mathematical computations that put the test data in "real world" perspective for the jury.<sup>103</sup> For example, in blood sample identification, there is little significance to the fact that similarities were found between a sample of the defendant's blood and a sample of blood taken from a crime scene, until that fact is placed in context by the statistical probability that the two samples would match if indeed it was not the defendant's blood found at the scene. Statistical evidence is scientific evidence in its own right, and the reliability of the statistical method used in making the computations must be evaluated independently of the court's evaluation of the reliability of the theory underlying the actual testing of the evidence.<sup>104</sup> As a result of the failure of the

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102. The majority opinion makes no mention of the dried or fresh state of the blood that was tested.

103. See DAVID W. BARNES, *STATISTICS AS PROOF* 3-4 (1983). There are two types of statistics, descriptive and inferential. Descriptive statistics use pictures and graphs to display information. *Id.* Inferential statistics allow conclusions to be drawn where complete information is unavailable. *Id.* As used in the courtroom setting, inferential statistics allow finders of fact to draw conclusions about factual situations without having all of the relevant and material information. *Id.*

104. See MORRIS H. DEGROOT ET AL., *STATISTICS AND THE LAW* (1986). Statistical theory and methodology, like that of the so called "bench" or laboratory sciences, may not be universally accepted within the discipline. *Id.* at xi. "Contemporary methods that some statisticians believe are most practical are regarded by others as most impractical." *Id.* The authors argue that "[e]ven the methods that are regarded as *standard* by some statisticians are regarded as inappropriate by others. *Id.*

court to establish the reliability of the novel application of the electrophoresis procedure at the outset, there was no assurance that the data compiled from the tests also rested on a trustworthy foundation.

As Judge Deen noted in joining to uphold the conviction, other nonscientific evidence supported the jury's findings.<sup>105</sup> However, the valuable screening function of the trial court is eroded if scientific evidence is to be freely admitted, with the weight the jury might give the evidence the only remaining safeguard. Georgia courts, like those of other jurisdictions, have long recognized that scientific evidence may be "beyond the ken"<sup>106</sup> of the average juror and require the testimony of experts for understanding. In contrast, the trial judge might use the opportunity to reflect upon proffered evidence before trial, using resources unavailable to the jury to conduct his own inquiry into the reliability of a particular piece of evidence. As Judge Deen argued, such an inquiry by the trial court serves as a screen against the admission of unproven scientific evidence.<sup>107</sup>

Other Georgia courts have admitted novel scientific evidence without explicit recognition of the need for a special standard of reliability to evaluate either the underlying theory or a particular application. In *Williams v. State*,<sup>108</sup> a mass murder case, the Georgia Supreme Court upheld a conviction based in part on evidence derived from analysis of fibers found on the bodies of a number of murder victims.<sup>109</sup> The prosecution claimed that scientific analysis of the fibers found on the victims showed that they matched fibers taken from a bedspread and carpets belonging to the defendant.<sup>110</sup> To demonstrate the significance of the fibers, the state introduced expert testimony regarding the mathematical probability of finding similarities among fibers

105. 308 S.E.2d 413, 416 (Ga. Ct. App. 1983).

106. *Smith v. State*, 277 S.E.2d 678 (Ga. 1981) (noting that an expert may testify to knowledge that is beyond the ken of the average juror).

107. *Graham*, 308 S.E.2d at 416 (Deen, J., concurring specially). The jury must "understand whether the data submitted to them is factually supported, or . . . just a speculative estimate." *Id.* Judge Deen later stated that this inquiry was the duty of the trial, and not the appellate, court. See *Bostic v. State*, 326 S.E.2d 849, 852 (Ga. Ct. App. 1985) (Deen, J., dissenting).

108. 312 S.E.2d 40 (Ga. 1983).

109. *Id.* at 48. Williams was charged with two homicides. *Id.* The state introduced evidence relating to ten other murders to aid in establishing Williams' identity as the perpetrator of the charged crimes. *Id.*

110. *Id.*

found on the bodies of numerous victims and fibers taken from multiple sites in Williams' home and car.<sup>111</sup> The majority opinion only briefly addressed the admissibility of the fiber analysis and the expert's statistical inferences that the fibers connected Williams to the crimes.<sup>112</sup> The supreme court deferred to the findings of the trial court and upheld the admission of the fiber evidence and the statistical inferences drawn from it.<sup>113</sup>

In dissent, Justice Smith noted that the trial court failed to apply the *Harper* standard when it ruled on the admissibility of the fiber evidence.<sup>114</sup> The record indicated that the state failed to lay a foundation sufficient to support a finding that the test methodology used was scientifically valid.<sup>115</sup> Further, the state had not established, either at trial or on appeal, that the statistical inferences drawn from the fiber evidence had the requisite degree of reliability.<sup>116</sup> Because the probative value of the fiber evidence depended on the statistical significance of the matches, and because this significance was expressed to the jury as a matter having a high degree of confidence,<sup>117</sup> the dissent found the admission of the fiber evidence to be reversible error.<sup>118</sup>

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111. *Id.* at 52.

112. *Id.* at 72.

113. *Id.* The majority opinion, citing *Harper*, deferred to the trial court's finding of reliability, without enumeration of the basis of the trial court's ruling. *Id.* However, as did the court of appeals in *Jenkins*, the *Williams* court ruled that the statistical evidence was admissible as the opinion of an expert. *Id.* at 72.

114. *Id.* at 96 (Smith, J., dissenting).

115. *Id.* The dissent further noted that defense counsel had failed to raise an objection at trial to the scientific reliability of the state's fiber evidence, *id.* at 96 n.5, and cited this failure as "a significant example of counsel's ineffectiveness." *Id.* at 101.

116. *Id.* While maintaining that the verifiable certainty of the statistical inferences had not been shown, Justice Smith conceded that on appeal the verifiable certainty of the fiber analysis technology was probably established. *Id.* at 96.

117. *Id.* The prosecution argued that it was "virtually impossible for the fibers obtained from the bodies of eleven of the twelve victims to have originated anywhere other than the Williams environment." *Id.* (Smith, J., dissenting).

118. *Id.*

Since the evidence of guilt in this case was solely circumstantial, and because the ultimate conclusion of significance of the fiber matches was repeatedly placed before the jury in terms expressing a very high degree of confidence, the error in admitting the fiber evidence and testimony in all probability contributed to the jury's verdict.

*Id.* at 99. In addition to the absence of a showing that the scientific basis of the statistical inferences was verifiably certain, Justice Smith found that the information

The points raised by the *Williams* dissent further illustrate the importance of an evaluation of scientific evidence at the trial level to determine the reliability of its underlying theoretical foundation and an additional inquiry into the validity of testing procedures used to arrive at expert conclusions. When the determination of a case rests in large part upon the admission or non-admission of a novel type of scientific evidence, the need for trial court inquiry and screening assumes critical significance.

*Williams* was a capital murder case with a number of complex issues raised on appeal.<sup>119</sup> As in *Jenkins* and *Graham*, the expert fiber testimony was introduced to link the defendant to the victim.<sup>120</sup> The fiber evidence was not by itself dispositive, but was considered by the jury in the aggregate with other nonscientific evidence in making the connection between the defendant and the victim.<sup>121</sup> The weight that the jury actually gave to any particular piece of evidence in reaching its verdict cannot be determined; however, the conclusion is inescapable that in reaching its verdict, the jury was exposed to scientific evidence of undetermined reliability.

Seven years after *Williams*, in another highly publicized homicide case, the Georgia Supreme Court took a remarkably different approach in determining the admissibility of novel scientific evidence. In *Caldwell v. State*,<sup>122</sup> the supreme court examined the admissibility of DNA identification evidence<sup>123</sup> in a case of first impression in the state. The *Caldwell* court created a test which merged elements of the broad *Jenkins* standard with the *Harper* inquiry into the verifiable certainty of the underlying theory.

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the expert witness relied on in calculating his probabilities and testified to incorporated inadmissible hearsay. *Id.* "Deadman's mathematical calculations were particularly worthless in light of the fact that they were in several instances based not only on hearsay evidence but on his own unproven assumptions." *Id.* at 98. Citing the Georgia rule that "hearsay, even if admitted without objection, has no probative value and cannot be considered to sustain a verdict," Justice Smith also found the testimony inadmissible as a violation of the defendant's right to confront witnesses. *Id.*

119. *Williams* raised on appeal, *inter alia*, the state's denial of the opportunity for defense experts to examine the fiber evidence, the state's refusal to provide scientific reports derived from instrument analysis of the fiber evidence, and ineffective assistance of counsel. *Id.* at 48, 51.

120. *Id.* at 48.

121. *Id.*

122. *Caldwell*, 393 S.E.2d 436 (Ga. 1990).

123. See *supra* note 7.

The court first detailed at some length the relevant scientific principles which underlie DNA identification.<sup>124</sup> The court noted, however, that the specific dispute in the case arose not from a question about the reliability of the theory underlying the test, but rather from the methodology of the testing techniques that the laboratory employed.<sup>125</sup> As did the court in *Jenkins*, the *Caldwell* court framed the issue as whether disputes regarding testing technique implicated the admissibility of the evidence or went merely to its weight.<sup>126</sup>

Noting the novelty of the forensic use of DNA identification, the complexity of the tests employed, and the lack of national standards for the regulation of labs that perform DNA testing, the Georgia Supreme Court concluded that the trial court was correct in determining not only the reliability of the underlying scientific principles, but also in inquiring into the validity of the technique used in performing the tests.<sup>127</sup>

The supreme court further approved the trial court's inquiry into the protocol used by the testing laboratory to safeguard against human error that could lead to erroneous results, such as mislabeling or specimen contamination.<sup>128</sup> The court also approved the lower court's reliance upon expert testimony regarding the reliability and validity of the "visual observation" method of determining a match between the evidentiary sample and the defendant's sample.<sup>129</sup>

Most importantly, the *Caldwell* court took the critical additional step of distinguishing the reliability of the testing procedure from the reliability of the interpretive statistical evidence.<sup>130</sup> While finding the tests themselves to be valid, the supreme court found the admission of expert testimony regarding the statistical significance of the laboratory findings to be error.<sup>131</sup> The databases used by the testing laboratory relied on

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124. 393 S.E.2d at 437-41.

125. *Id.* at 441.

126. *Id.*

127. *Id.*

128. *Id.* at 442.

129. *Id.* at 443.

130. *Id.*

131. *Id.* The testing laboratory used databases presumed, but not proven, to be in Hardy-Weinberg equilibrium. *Id.* This assumption formed the basis for the probability calculations of finding a DNA match between the evidentiary specimen, the defendant's known specimen, and a specimen taken at random from the population. *Id.* at 443-44.

population theories in calculating the probability of a coincidental match.<sup>132</sup> The accuracy of the population theories used by the testing lab was questioned by a defense expert, and this testimony was not rebutted by the state.<sup>133</sup> The court determined that this unrebutted testimony sufficiently refuted the established reliability of the statistical technique as applied in the case before it.<sup>134</sup> Therefore, the state would not be allowed to admit evidence of statistical significance that relied on the population theory assumptions, but instead must use a more conservative method with undisputed validity.<sup>135</sup>

In concluding, the court noted with approval that the laboratory reports of the testing procedures, data, and results were disclosed to the defendant, and that the defense, as well as the state, was assisted by well-qualified experts.<sup>136</sup>

### III. EXITING THE TWILIGHT ZONE

The lack of success by state and federal courts in creating a workable standard for the admissibility of scientific evidence suggests that perhaps a single mechanistic standard, whether it is "general acceptance in the scientific community," "relevancy," or "verifiable certainty," is inadequate to measure the reliability of each of the many types and applications of scientific tests that confront trial courts today.<sup>137</sup> Rather than continue to struggle to define a fail-safe standard, a number of commentators have

132. *Id.* at 443.

133. *Id.* Although the state's experts testified that the laboratory's assumptions were not unreasonable, only the defense expert had actually made the calculations. *Id.*

134. *Id.* at 443.

135. *Id.* at 444. The excluded technique established a probability of a coincidental match as one in twenty-four million. *Id.* The more conservative technique approved by the court reduced the statistical probability of a coincidental match to one in two hundred fifty thousand. *Id.* at 443-44.

136. *Id.* at 444. Over a five month period, the trial court heard evidence from six state experts and four defense experts in concluding that both the relevant scientific principles and techniques used were valid and that the laboratory procedures had been performed in a scientifically acceptable manner. *Id.* at 437.

137. See Moenssens, *supra* note 10, at 565-66 (finding the struggle to apply a single test to be an example of the scientific illiteracy which initially hampers the courts); see also Black, *supra* note 8, at 629 n.169 (arguing that the problems of scientific evidence would disappear through court control based on identification and examination of the reasoning behind conclusions). Black also anecdotally notes that the wife of the *Frye* defendant once commented that following *Frye's* release from prison he caused her "nothing but unrelenting trouble," and that "devotees of scientific evidence have long felt the same way." *Id.*

proposed that the answer to the substantive question of whether scientific evidence is sufficiently reliable might be found in a procedural solution.<sup>138</sup>

The Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals*<sup>139</sup> set forth several factors to provide guidance to lower courts faced with the task of ruling on the admissibility of scientific evidence.<sup>140</sup> While not attempting to set forth an exhaustive list, the Court cited the following to be "pertinent considerations":<sup>141</sup> 1) whether a theory or technique can be, and has been, tested;<sup>142</sup> 2) whether the theory or technique has been subjected to peer review and publication;<sup>143</sup> 3) the known or potential rate of error of a particular technique under consideration;<sup>144</sup> and 4) acceptance of the theory or technique within the scientific community.<sup>145</sup> The Supreme Court emphasized that the trial court should use a flexible approach,

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138. Edward J. Imwinkelried, *Judge versus Jury: Who Should Decide Questions of Preliminary Facts Conditioning the Admissibility of Scientific Evidence?*, 25 WM. & MARY L. REV. 577 (1984) (advocating that to ensure the reliability of the jury's ultimate verdict the trial judge should determine the preliminary fact of the validity of the theory or technique underlying proffered scientific evidence); Herasimchuk, *supra* note 10, at 254-55 (suggesting that the trial court should consider available steps to ensure that proffered evidence does not mislead jury, including pre-trial review of expert testimony, greater pre-trial discovery of scientific reports, an assessment of the opponent's preparation for cross-examination on the basis of published literature in the field, the availability of other experts, and the adequacy of limiting instructions to the jury); Black, *supra* note 8, at 692-93 (noting that pre-trial resolution of disputes about scientific evidence through summary judgment or orders *in limine* should be particularly encouraged); *see also* Edmund B. Spaeth, Jr., *Proposed Amendments to the Federal Rules on Admissibility of Scientific Evidence: A Judge's Perspective*, 115 F.R.D. 112 (1986) (discussing how experience as an appellate judge convinced the author that substantive problems are often best attacked by procedural means).

139. 113 S. Ct. 2786 (1993).

140. *Id.* at 2797.

141. *Id.*

142. Justice Blackmun wrote: "Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry." *Id.* at 2796 (quoting Green, *Expert Witnesses and Sufficiency of Evidence in Toxic Substances Litigation: The Legacy of Agent Orange and Bendectin Litigation*, 86 NW. U. L. REV. 643, 645 (1992)).

143. *Id.* at 2797. The court noted that publication alone is not a "*sine qua non* of admissibility," as some theories are unpublished because they are too new or are of limited interest. *Id.* Publication is relevant, however, because it permits scrutiny by the scientific community which aids in detecting flaws in methodology. *Id.*

144. *Id.*

145. *Id.* While no longer dispositive, the Court seemingly retains the *Frye* test as one factor in the trial court's analysis. *Id.*



with the focus on principles and methodology rather than on conclusions.<sup>146</sup>

The analysis used by the *Daubert* Court provides a useful model for Georgia trial courts ruling on the admissibility of scientific evidence. While ante-litem notice is not required by Georgia law, commentators<sup>147</sup> and other courts<sup>148</sup> have suggested a requirement that such notice be given in all cases where counsel intends to present scientific evidence. Pre-trial review of contested scientific evidence would permit the judge to educate himself about the reliability of the proffered scientific evidence, an area in which few judges have much background or education, through the adversary process, an area in which trial judges are themselves experts.<sup>149</sup>

#### A. Pre-Trial Review of Contested Scientific Evidence

The court's inquiry into the trustworthiness of proffered evidence should vary depending upon the type of evidence at issue.<sup>150</sup> Some types of scientific evidence, such as fingerprinting, certain types of drug identification, and ballistics tests have become so commonplace and are so widely accepted

146. *Id.* at 2792.

147. Giannelli, *supra* note 2, at 800 (noting that the most basic discovery need concerning scientific evidence is advance notice that an expert will testify at trial); see also Giannelli, *supra* note 3, at 1240. Effective cross-examination and refutation presuppose adequate notice and discovery of the opponent's evidence; this is especially true of challenges to innovative scientific evidence, which requires extensive preparation including identification and consultation with experts. *Id.*

148. *United States v. Downing*, 753 F.2d 1224 (3d Cir. 1985). The *Downing* court ruled that Rule 702 of the Federal Rules of Evidence required a trial court ruling upon the admission of novel scientific evidence to conduct a preliminary inquiry focusing on (1) the soundness and reliability of the process or technique used in generating the evidence, (2) the possibility that admitting the evidence would overwhelm, confuse, or mislead the jury, and (3) the proffered connection between the scientific research or test result to be presented, and particular disputed factual issues in the case. *Id.* at 1237.

149. Kenneth E. Melson, *Proposed Amendments to the Federal Rules on Admissibility of Scientific Evidence: A Prosecutor's Perspective*, 115 F.R.D. 126, 127 (1986). A pretrial motion allows parties to brief the subject and gives the trial judge an opportunity to take the motion under advisement while reflecting on the testimony and accompanying briefs. *Id.*

150. Giannelli, *supra* note 3, at 1202. Professor Giannelli takes the position that an inquiry into the validity of a technique or its underlying principle is critical only in the case of a novel scientific technique. *Id.* The court's inquiry is not easily standardized, however, not merely because a particular piece of proffered scientific evidence is novel, but rather because of the wide variety of types of evidence deemed "scientific." *Id.*

that an inquiry into the reliability of the underlying theory would be unnecessary.<sup>151</sup> However, judicial caution is still warranted, because it is in these types of tests that jurors tend to place the most confidence. Even the most scientifically illiterate juror has been exposed to the infallibility of tests such as fingerprinting through television and detective novels. Indeed, when the prosecution fails to use scientific evidence, the jury may perceive this as the state's failure to prove its case.<sup>152</sup>

The court should also consider the purpose for which the proffered evidence is submitted. Evidence which is central to a contested issue, such as the establishment of the identity of a perpetrator by DNA analysis, demands greater judicial scrutiny of its reliability than evidence which is only peripheral.<sup>153</sup>

As an additional safeguard against a jury's possibly inflated estimation of reliability, the trial judge could use the pre-trial review to note the type of test methodology employed to determine if the test actually performed is in fact the test which enjoys widespread acceptance, or if a different methodology was required due to special circumstances. Also in a pre-trial review, the court may become aware, with the assistance of defense counsel, of any issues which may call into question the validity of the test results, such as lack of adherence to the test procedure or chain of custody problems.

Pre-trial scrutiny is particularly valuable when novel or complex scientific evidence is at issue. When the proffered

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151. See *Mitchell v. State*, 407 S.E.2d 115 (Ga. Ct. App. 1991) (holding that reliability of drug testing method was sufficiently reliable where expert testified that test performed on substance found in suspect's pocket was the same test used in over 5000 criminal trials); see also *Williams v. State*, 405 S.E.2d 716 (Ga. Ct. App. 1991) (holding that cautionary instruction to jury that it was free to believe or disbelieve the expert's opinion as to purity of seized cocaine was sufficient where defendant asserted that test procedure was inadequate to determine purity because the state lab had tested only a small sample, where expert's visual determination that powdered substance contained in five separate plastic bags seized from defendant appeared to be identical in nature, color, and composition, and expert had previously examined between 20,000-30,000 samples of cocaine). But see *Bostic v. State*, 326 S.E.2d 849 (Ga. Ct. App. 1985), where on appeal, the majority took judicial notice of a treatise citing usefulness of tests that the forensic chemist had testified that he had used when the trial court made no finding of reliability of test procedure for detection of cocaine. The dissenting judge would have remanded the case for the trial court to make initial factfinding of reliability of laboratory tests for detection of cocaine. *Id.* at 852 (Deen, J., dissenting).

152. See Moenssens, *supra* note 10, at 566-67.

153. Herasimchuk, *supra* note 10, at 229.

scientific evidence does not come from that category of well-established tests of which courts may take judicial notice, the court must make a more in-depth inquiry into the reliability of the test's underlying scientific theory and application.<sup>154</sup> To achieve uniformity among the trial courts, this inquiry requires more objectively defined contours than those provided by the vague "verifiably certain" standard set out in *Harper*.<sup>155</sup> The factors listed in *Daubert* provide guidance to the trial court in separating novel, yet reliable scientific theory and analysis from "wishful thinking." By applying these factors, the court's inquiry is directed toward an examination of the characteristics of the evidence, the foundation laid, and the context in which the evidence is proffered.<sup>156</sup>

### B. Judicial Scrutiny of Expert Testimony

The presentation of scientific evidence necessarily requires the testimony of an expert witness.<sup>157</sup> Georgia trial courts are given broad discretion in determining when expert testimony is required,<sup>158</sup> who may be qualified to testify as an expert,<sup>159</sup>

154. Giannelli, *supra* note 3, at 1203.

155. 292 S.E.2d 389 (Ga. 1982).

156. See Mark McCormick, *Scientific Evidence: Defining a New Approach to Admissibility*, 67 IOWA L. REV. 879, 911-12 (1982). Justice McCormick, in an article published before the Supreme Court's decision in *Daubert*, enumerated his own list of factors which he described as reflecting factors employed by a number of courts in ruling on the admissibility of many types of scientific evidence. *Id.* at 911-12. Justice McCormick's list is somewhat more exhaustive than that of the Supreme Court, and includes:

- (1) the potential error rate in using the technique;
- (2) the existence and maintenance of standards governing its use;
- (3) presence of safeguards in the characteristics of the technique;
- (4) analogy to other scientific techniques whose results are admissible;
- (5) the extent to which the technique has been accepted by scientists in the field involved;
- (6) the nature and breadth of the inference adduced;
- (7) the clarity and simplicity with which the technique can be described and its results explained;
- (8) the extent to which the basic data are verifiable by the court and jury;
- (9) the availability of other experts to test and evaluate the technique;
- (10) the probative significance of the evidence in the circumstances of the case; and
- (11) the care with which the technique was employed in the case.

*Id.* at 911-12.

157. See *Jones v. State*, 208 S.E.2d 850, 853 (Ga. 1974) (ruling that expert opinion, like lay opinion, is admitted only where necessary or helpful).

158. See *id.*; *Gage v. Tiffin Motor Homes*, 266 S.E.2d 345 (Ga. Ct. App. 1980).

and the breadth of expertise to which the expert may testify.<sup>160</sup> In conjunction with an inquiry into the reliability of the proffered theory or technique, the trial court might use a pre-trial review to conduct a preliminary scrutiny of the qualifications of the experts who will testify.<sup>161</sup>

Because some types of scientific evidence are complex and may be unique to a narrowly specialized field, the trial court should note whether the qualifications and skills an expert possesses provide the requisite knowledge necessary to address the issues before the court.<sup>162</sup> For example, if the challenge to a piece of evidence is based on the manner in which a procedure was performed, a technician may be well qualified to testify about the questioned technique. However, if the evidentiary challenge is not to the way the test was performed, but rather to the reliability of the scientific theory which underlies it, the same technician who may be qualified to testify as to the operation of a machine may be unqualified to give meaningful testimony about

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159. *Oak Ridge Village v. La Siesta Mobile Home Park*, 203 S.E.2d 748 (Ga. Ct. App. 1974).

Whether a witness has such learning or experience in a particular art, science, or profession to be treated as an expert, or to be deemed *prima facie* as an expert, is a matter addressed to the sound discretion of the trial court, and such discretion will not be disturbed unless manifestly abused.

*Id.* at 750; *see also* Gary Christy, *Evidence*, 38 MERCER L. REV. 215 (1986). Georgia folklore defines an expert as "a man with a briefcase who has traveled over fifty miles to the courthouse." *Id.* at 242.

160. *See, e.g., Oak Ridge Village*, 203 S.E.2d at 750 (permitting electrical, plumbing, heating, and air-conditioning contractor to testify as to value of land damaged by overflow of stream); *Inta-Roto v. Guest*, 286 S.E.2d 61, 68 (Ga. Ct. App. 1981) ("Where one has been formally educated in a particular trade or profession, additional expertise by application of that knowledge to a specific problem is not necessary in order to sustain one as an expert."); *see also* *Madden v. Solomon*, 396 S.E.2d 245 (Ga. Ct. App. 1990) (qualifying a chiropractor to give expert testimony regarding thermography testing, despite contention that thermography was not within scope of chiropractic as defined by Georgia law). *But see* *Goodman v. Lipman*, 399 S.E.2d 255, 257 (Ga. Ct. App. 1990) ("Conclusory statements as to a witness' 'knowledge' or 'familiarity' in a particular art or skill are not probative in determining the witness' qualifications as an expert witness. Such determinations must be based on evidence of the witness' education and experience in the pertinent field of study.").

161. *See* Giannelli, *supra* note 2, at 805-06 (pointing out that expert qualifications should be examined not only to determine that the individual has the required expertise in the relevant field, but also in order to discover deliberate falsifications of credentials).

162. *Herasimchuk*, *supra* note 10, at 239-40. "Just as an expert's testimony must 'fit' the disputed issues at trial, so must his experience 'fit' the testimony offered." *Id.* at 239.

the scientific principles upon which the test is based.<sup>163</sup> Further, even an eminently qualified expert may be unable to provide meaningful assistance in understanding a novel theory from within his general discipline that does not impact his particular area of expertise.<sup>164</sup>

Georgia law makes no distinction among the types of specialized knowledge held by subspecialists.<sup>165</sup> For example, a licensed physician may testify as an expert on questions outside his area of practice or specialization.<sup>166</sup> As a general rule, the fact that a physician is not a specialist in the field in which he offers an opinion affects the weight, but not the admissibility, of the testimony.<sup>167</sup>

Whether or not this rule is correct in the civil arena,<sup>168</sup> the

163. Giannelli, *supra* note 3, at 1214-15. Because technicians follow prescribed routines and are not expected to understand the fundamentals which underpin them, Professor Giannelli finds the view of a scientist as essential when evaluating novel scientific evidence. *Id.* At the same time, the reverse may be true. *Id.* A Nobel laureate, well versed in scientific principle and theory, may be quite unable to tell the court how to turn on a machine that is used in tests which apply his theory.

164. Herasimchuk, *supra* note 10, at 240. Professor Herasimchuk lists several factors to guide the determination of whether specialized knowledge is required to qualify a witness as an expert: (1) the complexity of the scientific field, (2) the conclusiveness or degree of particularization of the expert's testimony, (3) the exactness of the findings or conclusions. *Id.* With these factors, the need for a highly qualified expert increases as evidence departs further from the jury's common understanding or education, as it provides opinion regarding centrally contested issues rather than background information, or where the expert's opinion is objective and determinative of a central issue rather than subjective or inconclusive. *Id.*

165. See O.C.G.A. § 24-9-67 (1982).

166. Beatty v. Morgan, 317 S.E.2d 662 (Ga. Ct. App. 1984); accord Sanford v. Howard, 288 S.E.2d 739 (Ga. Ct. App. 1982) (allowing orthopedist to testify as to a proper standard of care for podiatrist). But see Bethea v. Smith, 336 S.E.2d 295 (Ga. Ct. App. 1985) (disallowing podiatrist to give expert testimony regarding standard of care by orthopedist).

167. See Black, *supra* note 8, at 659. Physician testimony typically is addressed to showing legal causation, where the standard for admissibility is "reasonable medical certainty," rather than general acceptance or reliability. *Id.* Black finds that the liberal qualification of physicians as experts stems from their rigorous education and the requirement for licensure. *Id.* at 662.

168. The correctness of this rule which liberally defines the qualifications of an expert was recently brought into question in Georgia in the civil context as well. See Wells v. Ortho Pharmaceutical Corp., 615 F. Supp. 262 (N.D. Ga. 1985), *aff'd in part*, 788 F.2d 741 (11th Cir. 1986). In Wells, the court resolved conflicts in expert testimony regarding causation of the plaintiff's birth defects by the defendant's spermiocide by weighing the credibility of the experts. *Id.* The plaintiff's theory of causation was based on published studies, and the court found that the defendant's expert failed to sufficiently rebut the plaintiff's theory. *Id.* at 292. Cf. Smith v. Ortho Pharmaceutical Corp., 770 F. Supp. 1561 (N.D. Ga. 1991). There, the same experts

constitutional protections afforded criminal defendants argue for heightened scrutiny of the qualifications of experts who offer conclusions based on scientific evidence in criminal cases.<sup>169</sup> Most scientific evidence is offered by the state which also carries the burden to prove facts beyond a reasonable doubt.<sup>170</sup> The risk of error created by reliance upon an expert, possibly with minimal qualifications,<sup>171</sup> and who is often an employee of the state's crime lab<sup>172</sup> may improperly shift the burden to the criminal defendant.<sup>173</sup> Due process would seem to require heightened scrutiny of evidence derived from scientific testing, including the theoretical principles underlying the test, the testing methods actually employed, the qualifications of the technicians performing the test, and the qualifications of the testing expert.<sup>174</sup>

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testified in another suit alleging that a spermicide caused the plaintiff's birth defect. *Id.* at 1567. The *Smith* court found that although neither expert had training or experience in medical genetics, each qualified as an expert under Georgia's broad rule that lack of expertise in a particular field will go to the weight of testimony and not to admissibility. *Id.* at 1569. However, summary judgment was granted to the defendant upon the court's determination that the studies relied upon by the experts (the same studies relied upon in *Wells*) were not of the type relied upon by experts with training in the relevant field. *Id.* at 1582.

169. See Gianelli, *supra* note 2, at 805-06.

170. *In re Winship*, 397 U.S. 358 (1970).

171. See Moenssens, *supra* note 10, at 560-61. The educational and regulatory underpinnings which courts have found to call for a liberal finding of expertise among physicians are notably absent from the resumes of many forensic experts. *Id.* Forensic labs often hire unqualified and untrained people. *Id.* Professor Moenssens also noted that while certification is not required in many forensic specialties, including the common field of fingerprint testing, one study showed that of a group of examiners previously qualified to testify as experts who opted to take a certification exam, only 47% passed. *Id.*

172. See Melson, *supra* note 149; see also Giannelli, *supra* note 2, at 799 (discussing that over 300 crime labs operate in this country, 80% of which are under the control of the police).

173. See Giannelli, *supra* note 3, at 1246. Professor Giannelli would require the state in a criminal proceeding to establish the reliability of novel scientific evidence beyond a reasonable doubt, while criminal defendants and civil litigants would be required to demonstrate the reliability of the proffered evidence by a preponderance of the evidence. *Id.* at 1248. See Melson, *supra* note 149; see also Giannelli, *supra* note 2, at 799 (discussing that over 300 crime labs operate in this country, 80% of which are under the control of the police).

174. *Id.*; see also *Law v. State*, 307 S.E.2d 904 (Ga. 1983). Justice Smith noted:

A basic principle of scientific testing is that careful records of test procedure and results are to be scrupulously maintained. A scientific test without an accompanying report of the testing environment, number of trials, raw results and analyzed data is in reality no test at all. The majority opinion condones the performance and use of haphazard, hasty,

## CONCLUSION

Because of the complex nature of many scientific testing procedures and the lack of comfort and familiarity with scientific principles on the part of many attorneys, judges, and jurors, questions regarding the admissibility of scientific evidence occupy a special role among evidentiary dilemmas. The search for a "better mousetrap" in the form of an improved standard by which to evaluate the reliability of scientific evidence is but a single step toward a workable solution. Georgia courts might note that the adversary process itself, the domain of the legal profession, can play a significant role in bringing about just decisions on scientific matters. Rather than being forced into the role of ad hoc scientists, trial judges may instead do that which they do best: determine the facts and applicable law on the basis of the evidence and arguments presented by well-prepared opponents.

*Katharyne C. Johnson*

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inaccurate, unreliable and undocumented tests when a man's liberty is at stake.

*Id.* at 908 (Smith, J. dissenting); see also *Eason v. State*, 396 S.E.2d 492, 493 (Ga. 1990). Now writing for the majority, Justice Smith cited his dissent in *Law v. State*, and held that a thorough and sifting cross-examination necessarily depends on an inquiry into the expert's "intelligence, memory, accuracy, and veracity." *Id.* at 494.